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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/741,538	12/19/2003	David A. Petersen	2003P14535US	4649
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EXAMINER				
CHENG, JACQUELINE				
ART UNIT		PAPER NUMBER		
3768				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/741,538

**Applicant(s)**

PETERSEN ET AL.

**Examiner**

JACQUELINE CHENG

**Art Unit**

3768

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 April 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6, 9-12 and 14-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 9-12 and 14-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 April 2010 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB06)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date 6/9/10

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments and amendments filed April 8, 2010, with respect to the drawing objections, the claim objections, and the 35 U.S.C. 112 rejections have been fully considered and are persuasive. The objections of fig. 1, objections of claims 1 and 22, and 35 U.S.C. 112 rejection of claims 4 and 18 has been withdrawn.
2. Applicant's arguments filed April 8, 2010, with respect to the 35 U.S.C. 103(a) rejections over Hunt (US 2003/0139664 A1) or alternatively Hunt in view of Erikson (US 6,752,763 B2) have been fully considered but they are not persuasive. The examiner respectfully disagrees with the applicants arguments that Hunt does not teach having a conversion in a connector housing releasable from the ultrasound system, a cable connecting the transducer probe housing with the connector housing. The examiner believes that Hunt teaches that the components of the ultrasound system can be placed in various configurations one of which consists of a probe housing comprising the transducer and additional ultrasound circuitry separate from the housing for the ultrasound processor (paragraph 0028). The additional ultrasound circuitry could comprise of the beamformer 32, receiver 34, and analog to digital converters 36. Hunt also discloses that the transducer 18 is separate from the ultrasonic circuitry (paragraph 0022) which would lead to a housing for the transducer 18 (transducer probe housing), a housing for the beamformer 32, receiver 35, and analog to digital converters 36 (connector housing in which the converting is being done) and a housing for the ultrasonic processor 38 (ultrasound system), all of which Hunt discloses that the connection for a separate probe housing can be a wireless

connection or with a cable (paragraph 0029). It would be obvious to make cables releasable cables for the purpose of allowing different transducers to be connected with the housing (paragraph 0030). Alternatively Erikson shows it is obvious to have a releasable connection between an ultrasound system 270 and a connector housing 324 (fig. 5a).

3. Furthermore Hunt discloses a particular embodiment wherein user controls and/or other components of the ultrasound device are provided in a housing separate from the transducer housing and one or more additional housing can be provided for holding one or more components of the ultrasound device (paragraph 0042, 0043). For example as shown in fig. 6. where a second housing 40 (which can hold the conversion elements, the connector housing) is connected to the transducer in the first housing 16 (not shown, the transducer probe housing) and is connected to the ultrasound processor 38 in a third housing (not shown, ultrasound system) (paragraph 0042).

4. As to the applicant's arguments for claim 4 that Hunt teaches multiplexing but does not suggest partial beamformation of demultiplexed signals, the examiner respectfully disagrees, as disclosed in the previous rejection, Hunt discloses the ultrasound processor able to demultiplex channel information (paragraph 0035) and it would be obvious to add a demultiplexer to the partial beamformer for the purpose of the muxed signals from the transducer head needs to be first demuxed before the signals can be processed further.

5. As to the applicant's arguments for claim 6 that summing is not mixing, the examiner respectfully disagrees, by summing together the signals the signals are being mixed together.

6. As to the applicant's arguments for claim 17 that multiplier 690 is not sub-array mixing, the examiner meant the multiplier 690 to fulfill the (b) part of the claim of the multiplier being

used for the purpose of mixing to a frequency of the beamformer channels as the multiplier brings the frequency of the output back to the frequency of the beamformer channels (col. 10 line 2-31). The examiner believes the sub-array mixing is being done by the summer as discussed with claim 6.

7. It is for these reasons it is believed that the previous rejection dated January 8, 2010 still stands and is repeated below along with a new claim objection for claim 1.

#### ***Claim Objections***

8. **Claim 1** is objected to because of the following informalities: a method claim is directed towards a method, and not to apparatus parts such as a cable. It is suggested the last line of the claim be rewritten into a step versus a physical part, for example language such as where a cable is provided, or connecting is done with a cable. Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out

the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. **Claims 1, 22, and 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt (US 2003/0139664 A1) or alternatively Hunt in view of Erikson (US 6,752,763 B2).

12. Hunt discloses a transducer assembly comprising a transducer 18 within a probe housing (transducer probe housing) separate from a housing 16 (connector housing) for the other portions of the ultrasound circuitry 30. The transducer 18 is connected with the housing 16 via cables. To minimize the number of cables multiplexing (processing signals from a plurality M of elements of a multi-dimensional array to a less plurality N of processed signals) can be used in the probe housing (paragraph 0028, figs. 1 and 5). Further processing of the signals to a different form appropriate for the ultrasound system is performed in the connector housing 16 such as A/D converting 36 (fig. 5) or creating a beamformer by using delays with summing (mixing) (paragraph 0037). Hunt further discloses that the transducer assembly is connected to an ultrasound system 14 either wirelessly or through a cord (paragraph 0061). Hunt does not explicitly disclose if the cord is permanent or if it is releasable. It would be obvious to one skilled in the art to make the cord releasable for the purpose of being able to interchange either the ultrasound system 14 or the transducer assembly. Hunt discloses in general either releasable connections or permanent connections are well known in the art such as the connections between the probe housing and the connector housing can be either releasable or permanent (paragraph 0030). If the connection is releasable the housing 16 would then partially enclose the detachable

connector (for example the female USB connector for the male USB connector of the cord to connect to). Hunt also shows the desire and the ability of the transducer assembly to be capable of being used with various different types of ultrasound systems 14 (figs. 2a, 3 and 4) which would require a releasable connection if a cord was used.

13. Alternatively Erikson discloses a transducer probe assembly comprising a probe housing 320 and a connector housing 324 which houses a connector 326. The connector housing is releasably connected to the ultrasound system 270 (fig. 5a). It would be obvious to one skilled in the art at the time of the invention to make the connector housing of Hunt releasably connected with the ultrasound system for the purpose of being able to interchange the transducer probe used.

14. Claims 2, 4, 6, 9, 10, 12, 14-17, 19, 20, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt or alternatively Hunt in view of Erikson, as applied to claim 1 above, further in view of Leavitt (US 6,491,634 B1).

15. **Claim 2, 24:** Hunt discloses that the separate probe housing may include additional electronics such as portions of receive beamforming circuitry (paragraph 0031). Leavitt discloses splitting a receive beamforming circuitry so that a partial beamformer is located with the transducer probe. It would be obvious to one skilled in the art for a portion of the receive beamforming circuitry in Hunt to be a partial beamformer for the purpose of decreasing the amount of wires that has to exit the transducer probe (col. 2 line 45-49, col. 3 line 42-60)

16. **Claim 4, 6:** The other part of the receive beamforming circuitry would then be in the ultrasound processor 38. Hunt discloses the ultrasound processor operable to demultiplex channel

information (paragraph 0035) and furthermore discusses using a demultiplexer in combination with summing a plurality of signal elements and creating a beamformer by using delays with summing (mixing) (paragraph 0037). It would be obvious to add a demultiplexer to the partial beamformer for the purpose of the muxed signals from the transducer head needs to be first demuxed before the signals can be processed further.

17. **Claim 9, 10, 12, 14-16, 19, 20:** Hunt and Leavitt discloses most of what is claimed as discussed above in paragraph 11 of an external cable electrically connecting elements between the transducer 18 partially beamforming M elements and a connector housing 16 which outputs N elements from the signal processing device 38 which has a partial beamformer and a demultiplexer all of which is further discussed in paragraphs 14 and 15 above (elements are partially beamformed as well as summed (mixed) in ultrasound processor 38). It would be obvious to further connect the connector housing 16 with the ultrasound system 14 with a releasable cord connection which partially encloses a detachable connector as discussed above in paragraph 11. The connector further comprises a signal processing device 38 which has a partial beamformer as discussed in paragraph 15.

18. **Claim 17:** Leavitt discloses after the partial beamforming mixing the signals with a normalization factor in multiplier 690 (fig. 6) for the purpose of bringing the frequency of the output back to the frequency of the beamformer channels (col. 10 line 2-31). Although this is describing the partial beamformer 218 in the transducer probe, Leavitt also discloses that the other part of the beamformer, the main beamformer 226 (fig. 2) which would be in the connector housing of Hunt, can be implemented in a similar fashion as the partial beamformer 218 (col. 4 line 65-67).



19. **Claim 21:** Hunt further discloses using parallel beamforming where two or more transmit or receive beams are generated simultaneously may be used for the purpose of reducing power requirements (paragraph 0058).

20. **Claim 3** is rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt in view of Leavitt or alternatively Hunt in view of Erikson in view of Leavitt, as applied to claim 2 above, further in view of Chiang (US 5,839,442). Neither Hunt nor Leavitt discloses disclosing applying different phase shifts in a portion of the beamformer (partial beamformer). Both Hunt and Leavitt do disclose using a delay circuit in the beamformer and Hunt also discloses that any other now known or later developed beamforming circuitry can be used (Hunt paragraph 0033, Leavitt fig. 3). Chiang discloses achieving the delay in the delay circuit of the beamformer by applying phase shifting and then summing (combining signals) the outputs (fig. 6, col. 2 line 56-col. 3 line 8, col. 3 line 66-col. 4 line 12). It would therefore be obvious to one skilled in the art at the time of the invention to use any well known delay circuit for a partial beamformer for the purpose of getting the correct timing depending upon the type of ultrasound being used.

21. **Claim 5 and 22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt or alternatively Hunt in view of Erikson, as applied to claim 1 above, further in view of Peterson (2004/0181154 A1). Hunt does not disclose converting digital signals to analog signals however it would be obvious in the art to either convert analog to digital signal or digital to analog signals as Hunt discloses that either analog circuits or digital circuits can be used for any of the parts (paragraph 0024) so depending on the type of circuitry is used it would be obvious to use either

analog to digital converters or digital or analog converters as appropriate for the types of circuitry in the probe and the types of data exchanged with the base ultrasound unit such as disclosed by Peterson (paragraph 0015).

22. **Claim 11 and 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt in view of Leavitt or alternatively Hunt in view of Erikson in view of Leavitt, as applied to claims 9 and 16 above, further in view of Peterson. Hunt discloses most of what is claimed including the muxing of signals adjacent a transducer and demuxing of signals in a connector housing (see paragraph 15 above) but does not disclose converting digital signals to analog signals however it would be obvious in the art to either convert analog to digital signal or digital to analog signals as Hunt discloses that either analog circuits or digital circuits can be used for any of the parts (paragraph 0024) so depending on the type of circuitry is used it would be obvious to use either analog to digital converters or digital or analog converters as appropriate for the types of circuitry in the probe and the types of data exchanged with the base ultrasound unit such as disclosed by Peterson (paragraph 0015).

### ***Conclusion***

23. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

24. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JACQUELINE CHENG whose telephone number is (571)272-5596. The examiner can normally be reached on M-F 10:00-6:30.

26. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

27. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jacqueline Cheng/  
Examiner, Art Unit 3768

/Long V Le/  
Supervisory Patent Examiner, Art Unit 3768